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Consistent Direction Despite Wavering Policy: Reductions in Resident Physician Extended Duration Shifts Over 20 Years



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ABSTRACT

We examined data from 17,498 physicians-in-training who reported on 92,662 months of work over a 20-year study interval that included three major revisions to work hour limits. Extended duration shifts (≥ 24 hours; EDS) are much less common than they used to be. On average, first-year resident physicians (PGY1s) currently work a total of 4 EDS per year and 3 EDS per month during months in which any EDS are worked. This is in stark contrast to the experience of PGY1s training in the early 2000s when the average was approximately 1 EDS per week over the year. More senior resident physicians (PGY2+) have observed concurrent reductions despite their exclusion from the ACGME guidelines limiting EDS. Resident physicians across all levels of training in surgical programs continue to work more EDS than those in medical programs. Similarly, resident physicians on intensive care unit rotations work these shifts more frequently compared to other rotations.

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INTRODUCTION

The traditional extended duration shifts (EDS) of resident physicians (shifts greater than 24 consecutive

hours) have been a focus of national concern for more than 50 years.¹ Although evidence accumulated from clinical trials, observational studies, and laboratory sleep deprivation experiments shows that EDS present

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significant hazards to resident physicians as well as their patients,²⁻¹³ policies limiting resident-physician consecutive work hours in the US have vacillated. The Accreditation Council for Graduate Medical Education (ACGME) first implemented a 30-hour shift limit for resident physicians along with a limit of 80 weekly work hours in 2003.¹⁴ In 2011, 2 years after the National Academy of Medicine concluded it was unsafe for resident physicians to work more than 16 consecutive hours without sleep,¹⁵ ACGME implemented a 16-hour shift limit that applied only to first-year resident physicians (PGY1s).¹⁶ Compliance with this limit required significant adjustments to hospital staffing models in academic settings, where resident physicians provide much of the direct care for patients. In 2017, in response to continued debate and the results of two influential trials,^{17,18} which reported that hospital-level patient outcomes were not inferior among programs randomized to flexible work hours compared to those maintaining the 16-hour limit for PGY1s, ACGME eliminated the 16-hour shift limit.¹⁹ Since that time, PGY1s have again been allowed to work 28-hour EDS. None of these policy changes prohibited resident physicians in PGY 2 or above from working EDS. As science and policy on this topic have evolved, the extent to which programs eliminated and then re-introduced EDS has not been well-described. The authors of this article sought to characterize the frequency that resident physicians worked EDS before and after various policy changes over the past two decades.

STUDY DATA AND METHODS

We conducted national prospective cohort studies of resident physicians from 2002 to 2007 (Cohort 1), 2014-2017 (Cohort 2), and 2020-2023 (Cohort 3) by inviting graduating medical students and incoming resident physicians to participate in the study. The methods for Cohort 1 and Cohort 2 have been described previously.^{3,5,8} Recruitment for Cohort 3 was primarily facilitated by emailing designated institutional officials and program directors with a request to forward study invitations to their resident physicians. The research protocol was approved by the Mass General Brigham Institutional Review Board or historical equivalent (e.g. Partners Healthcare). All participants provided written or electronic informed consent. Participants were emailed a baseline demographic survey upon entering residency and monthly surveys for the duration of the study cohort. Monthly reports collected information on their work hours and sleep in the previous 4 weeks. We describe trends in the frequency of EDS and sleep obtained on those shifts across cohorts. Descriptive statistics account for clustering of repeated monthly surveys within participants. Statistical significance was defined by the exclusion of 95% confidence intervals.

STUDY RESULTS

PGY1

A total of 17,498 PGY1s provided 92,662 monthly reports across the three cohorts. The frequency of EDS

Table 1 The Frequency of Extended Duration Shifts Among PGY1 Resident-Physicians

	Cohort 1 2002-2007 N = 5680 Participants 30,848 Monthly Reports	Cohort 2 2014-2017 N = 9596 Participants 49,418 Monthly Reports	Cohort 3 2020-2023 N = 2222 Participants 12,396 Monthly Reports
Mean EDS (95% CI)			
Overall (per mo)	3.89 (3.82-3.94)	0.23 (0.21-0.25)	0.34 (0.32-0.36)
Medical program (per mo)	3.75 (3.69-3.81)	0.17 (0.15-0.18)	0.28 (0.26-0.30)
Surgical program (per mo)	5.08 (4.88-5.28)	0.78 (0.67-0.89)	0.91 (0.79-1.03)
During weeks on ICU rotations	1.82 (1.79-1.84)	0.09 (0.08-0.10)	0.15 (0.13-0.17)
During weeks on inpatient rotations	1.44 (1.43-1.46)	0.08 (0.07-0.08)	0.10 (0.09-0.10)
During weeks on all other rotations	1.37 (1.36-1.39)	0.02 (0.02-0.02)	0.06 (0.06-0.07)
Mean EDS (95% CI) in months they were worked			
Overall (per mo)	5.67 (5.62-5.72) 5013 of 5680 persons 21,120 of 30,848 mo	4.24 (4.11-4.38) 1342 of 9596 persons 2674 of 49,418 mo	2.93 (2.81-3.05) 593 of 2222 persons 4123 of 12,396 mo
Medical program (per mo)	5.55 (5.50-5.60)	4.21 (4.05-4.38)	2.77 (2.64-2.89)
Surgical program (per mo)	6.50 (6.32-6.68)	4.27 (3.99-4.54)	3.61 (3.28-3.93)
During weeks on ICU rotations	1.91 (1.89-1.94)	1.78 (1.68-1.89)	0.93 (0.86-1.00)
During weeks on inpatient rotations	1.70 (1.68-1.71)	1.59 (1.55-1.64)	0.71 (0.67-0.75)
During weeks on all other rotations	1.71 (1.70-1.73)	1.48 (1.34-1.63)	0.64 (0.61-0.68)

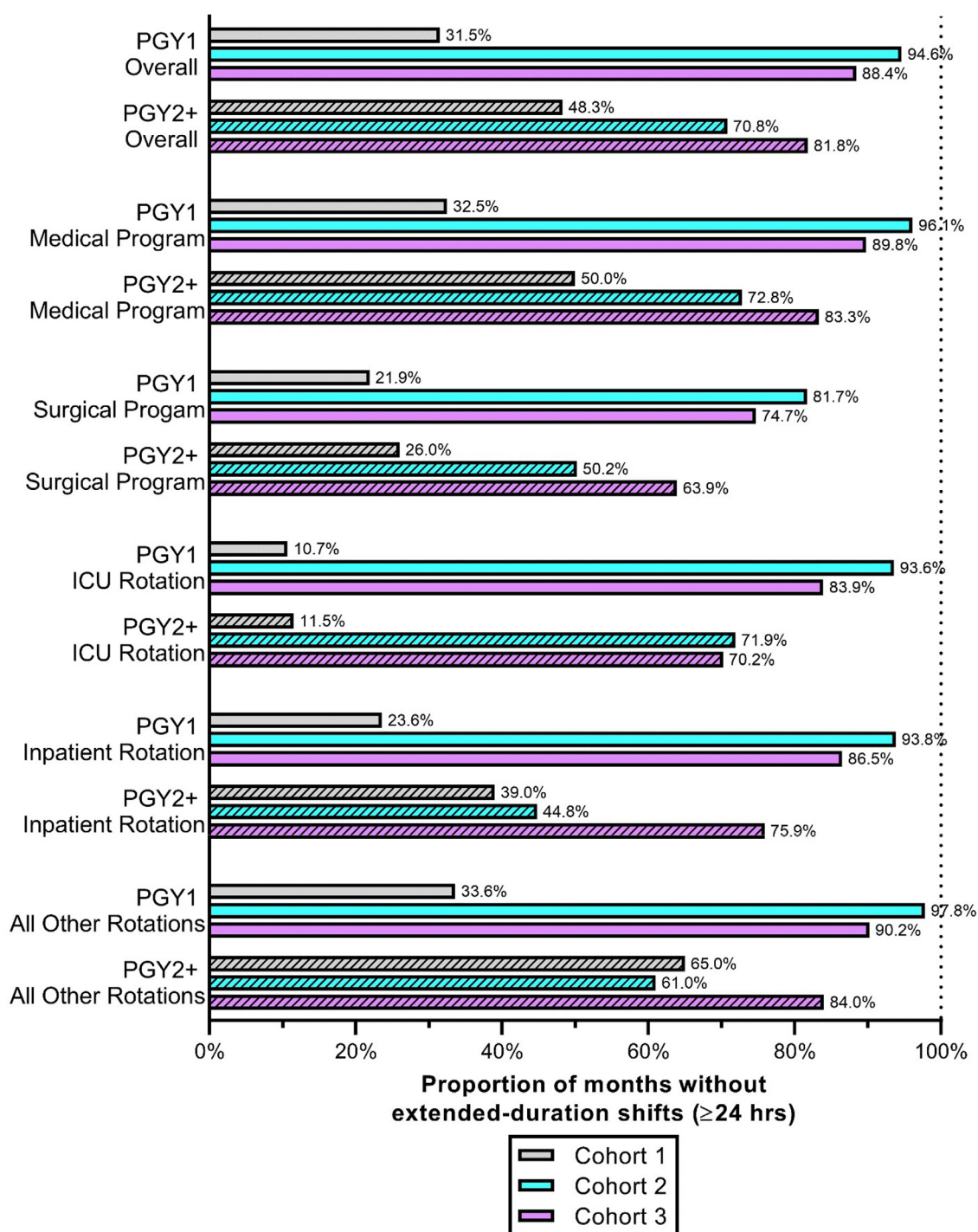


Figure The proportion of months free of extended duration work shifts by postgraduate year, program, and rotation.

was 3.9 per month in Cohort 1, 0.2 in Cohort 2, and 0.3 per month in Cohort 3 (Table 1). The proportion of months without any EDS increased over time (32% in Cohort 1, 95% in Cohort 2, and 88% in Cohort 3; Figure). EDS were more frequent in surgical compared to nonsurgical programs and on intensive care unit rotations compared to other rotations. In months when extended shifts were worked, the average frequency was

less than 1 per week in Cohort 3. The proportion of EDS without any sleep increased for each cohort (8% in Cohort 1, 30% in Cohort 2, and 35% in Cohort 3).

PGY2+

A total of 7205 PGY2+s provided 58,931 monthly reports. PGY2+ residents worked 2.4 EDS per month

Table 2 The Frequency of Extended Duration Shifts Among PGY2+ Resident-Physicians

	Cohort 1 2002-2007 N = 1747 Participants 14,173 Monthly Reports	Cohort 2 2014-2017 N = 3079 Participants 24,529 Monthly Reports	Cohort 3 2020-2023 N = 2379 Participants 20,229 Monthly Reports
Mean EDS (95% CI)			
Overall (per mo)	2.44 (2.34-2.54)	1.06 (1.00-1.12)	0.56 (0.54-0.58)
Medical program (per mo)	2.28 (2.19-2.37)	0.93 (0.88-0.98)	0.49 (0.47-0.51)
Surgical program (per mo)	4.51 (4.03-5.00)	2.41 (2.10-2.71)	1.53 (1.40-1.67)
During weeks on ICU rotations	1.73 (1.69-1.77)	0.80 (0.76-0.85)	0.28 (0.26-0.30)
During weeks on inpatient rotations	1.18 (1.14-1.21)	0.30 (0.28-0.32)	0.17 (0.16-0.18)
During weeks on all other rotations	0.61 (0.57-0.64)	0.10 (0.09-0.11)	0.11 (0.11-0.12)
Mean EDS (95% CI) in months they were worked			
Overall (per mo)	4.71 (4.61-4.82) 1430 of 1747 persons 7326 of 14,173 mo	3.64 (3.53-3.74) 1856 of 3079 persons 7152 of 24,529 mo	3.10 (2.95-3.25) 987 of 2379 persons 11,259 of 20,229 mo
Medical program (per mo)	4.56 (4.46-4.66)	3.43 (3.33-3.53)	2.90 (2.82-2.97)
Surgical program (per mo)	6.10 (5.68-6.52)	4.83 (4.45-5.21)	4.24 (4.00-4.48)
During weeks on ICU rotations	1.76 (1.72-1.80)	1.45 (1.41-1.50)	0.94 (0.90-0.98)
During weeks on inpatient rotations	1.23 (1.20-1.26)	0.91 (0.87-0.94)	0.72 (0.69-0.74)
During weeks on all other rotations	0.65 (0.61-0.69)	0.46 (0.43-0.50)	0.70 (0.68-0.72)

in Cohort 1, 1.1 EDS per month in Cohort 2, and 0.56 per month in Cohort 3 (Table 2). The proportion of months without any EDS increased over time (48% in Cohort 1, 71% in Cohort 2, and 82% in Cohort 3; Figure). EDS were more common among surgical programs and on intensive care unit rotations throughout the study interval. In Cohort 3, resident physicians in medical programs worked approximately 3 EDS per month, whereas surgical programs worked more than 4 per month. The proportion of EDS without sleep increased for each subsequent PGY2+ cohort (10% in Cohort 1, 19% in Cohort 2, and 29% in Cohort 3).

DISCUSSION

After Friedman and colleagues first documented the hazards of EDS in 1971, the frequency of EDS dropped from approximately 14 per month to 9 per month.¹ Following the 2003 ACGME duty hour limits, the frequency dropped further to 3.9 EDS per month (Cohort 1). After numerous studies documenting the hazards of EDS, the Institute of Medicine 2009 landmark report on resident physician work hours, and the ACGME's subsequent implementation of a 16-hour shift limit for PGY1s in 2011, their frequency fell precipitously to 0.2 EDS per month (Cohort 2)—with 95% of months completely free of EDS. Notwithstanding the lifting of the ACGME duty hour limit in 2017, their frequency has minimally rebounded and remains at 0.3 EDS per month (Cohort 3)—with 88% of months still completely free of EDS. Notably, even though

ACGME never prohibited PGY2+ resident physicians from working EDS, we observed substantial concurrent reductions in the frequency of EDS for PGY2+ resident physicians. Taken together, these data suggest that the documented hazards of EDS has led to a culture change in many medical centers that promotes safer work hours for both patients and resident physicians.

Nonetheless, resident physicians in some programs continue to be exposed to EDS. Indeed, since the lifting of the prohibition on EDS for PGY1s in 2017, these shifts have slightly increased in frequency, though they remain far less common than they were in the 2000s. Also of note, sleep on EDS has become increasingly scarce. In months that include EDS, at least one shift on average results in more than 24 hours of continuous wakefulness, a condition shown to induce performance decrements while providing care or commuting home that is comparable to legal intoxication.²⁰ Further investigation is required to understand why resident physicians are increasingly unable to sleep during EDS, including examination of workload.²¹

Limitations of this work include the observational study design, self-reported outcome ascertainment, and limited detail on individual programs that precludes accounting for program-level clustering. The response and cooperation rates of Cohorts 1 and 2 have been described previously; the demographic characteristics of respondents from those cohorts were similar to the broader population of PGY1s nationally.^{7,8,22} In Cohort 3, 5860 resident physicians consented to participate and 3657 contributed at least 1 monthly survey (with 2222

participating during their PGY1 year). The primary training hospitals of PGY1s in Cohort 3 spanned more than 800 unique ZIP codes, with PGY1s from all 50 states contributing to the analysis. The demographics of Cohort 3 are similar in many respects to those of resident physicians nationally, though our sample has greater representation from those identifying as female (61% of the analytic sample vs. ~47% of PGY1 residents nationally; [Supplementary Materials \[Appendix Table\]](#)). While our cohort represents only a fraction of all resident-physicians nationwide, it is a substantially higher fraction of the total workforce than other landmark cohorts that have driven policy such as the Nurse's Health Studies (where enrollment has approached 1% of the workforce).²³ Strengths of the study include robust national data collection across a greater than 20-year study interval that enables direct reporting of actual work hours from resident-physicians without fear of repercussion to themselves or their training program.

CONCLUSION

The data indicate that many residency programs have identified ways to completely eliminate EDS. Increased awareness of physician safety, burnout, and well-being as well as recognition of the patient-safety hazards resulting from EDS, may contribute to the design of work schedules that promote better work-life balance.²⁴ Resident physicians may value programs that prioritize healthy work hours.²⁵ However, the concentration of EDS at certain programs and/or specialties may differentially harm resident physicians who do not match to their preferred program. Given the sustained reduction in EDS that has been achieved nationwide—which demonstrates the feasibility of the model—and the substantial risk that any EDS poses, we recommend that EDS be eliminated from all residency training programs in the United States.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.amjmed.2025.01.001](https://doi.org/10.1016/j.amjmed.2025.01.001).

Appendix Table The demographics of PGY1s in Cohort 3 Compared to the Characteristics of First-Year Residents Nationally

	Study Sample	ACGME National Data		
	2020-2023 (n = 2222)	2020-2021 (n = 34,754)	2021-2022 (n = 35,729)	2022-2023 (n = 36,628)
Age	28.5 ± 4.3	29.8	29.8	29.9
Female gender	61%	46%	47%	48%
Race/Ethnicity				
White	59%	50%	49%	48%
Asian	23%	26%	27%	27%
Black or African American	4%	6%	6%	6%
Other or multiple	6%	9%	7%	7%
Hispanic	8%	5%	9%	10%
Unknown	0%	4%	2%	2%
Specialty*				
Internal medicine	26%	28%	28%	28%
Family medicine	13%	14%	14%	14%
Pediatrics	14%	9%	9%	9%
General surgery and surgical specialties	9%	10%	10%	10%
Emergency medicine	7%	8%	8%	8%
Obstetrics/gynecology	5%	4%	4%	4%
Psychiatry	6%	6%	6%	6%
Anesthesiology	6%	5%	5%	5%
Other (including combined)	14%	17%	17%	16%

ACGME National Data for gender and race/ethnicity includes all active residents (not only PGY1).

Our baseline questionnaire was administered immediately upon entry of residency. The timing of age information in the national data is not known. Slight over-representation of residents in Pediatrics may be due to more effective recruitment among Program Directors in Pediatrics, several of whom have ongoing collaborations with investigators. ACGME data confirm that female residents accounted for 71%-73% of all Pediatrics residents during the study interval.

*Percentage of PGY1 residents in each specialty. Percentages may not add to 100 due to rounding.